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kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,

[Continued on next page]

(54) Title: STACKED ACTUATOR APPARATUS, SYSTEM, AND METHOD

(57) Abstract: A method of fabricating a stacked electroactive transducer comprises a cyclic process for providing a multilayer stack. The stacked transducer can be manufactured using a roll-to-sheet lamination process including a vacuum belt process, various loop cast processes, and a continuous lamination process.

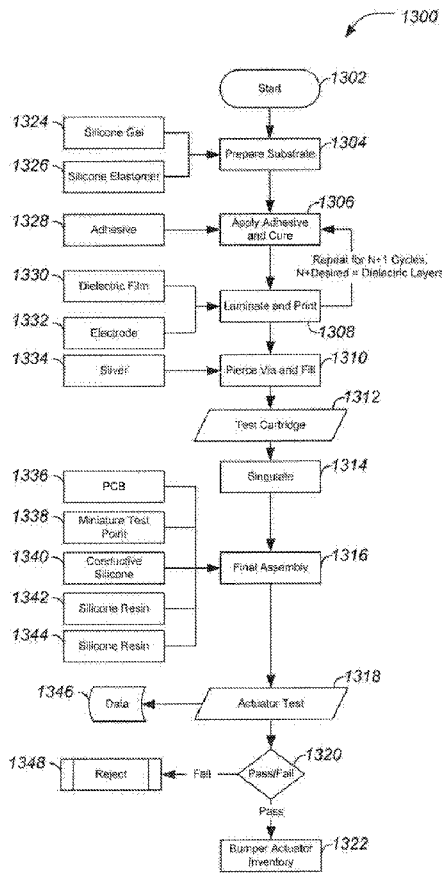


FIG. 13



BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

Published:

— with international search report (Art. 21(3))
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

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7 August 2014

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/068650

A. CLASSIFICATION OF SUBJECT MATTER
INV. H01L41/45 H01L41/27 H01L41/047 H01L41/338
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
H01L
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2005/086249 A1 (SIEMENS AG [DE]) 15 September 2005 (2005-09-15)	1,3,4,6, 8,10,12, 15
Y	page 4, line 15 - page 5, line 18 page 9 - page 11, line 20 figures 1,2,3a,3b	2,5-7, 9-11,13, 14
X	US 4 500 377 A (BROSSOUX DOMINIQUE [FR] ET AL) 19 February 1985 (1985-02-19)	1,3,4,6, 8,12,15
Y	figures 10-12	2,5-7,9, 10
Y	WO 2012/118916 A2 (BAYER MATERIALSCIENCE AG [DE]) 7 September 2012 (2012-09-07) page 20, line 14 - page 21, line 10	2
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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search 6 February 2014	Date of mailing of the international search report 24/06/2014
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Meul, Hans

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/068650

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2009/112988 A1 (FONDAZIONE ISTITUTO ITALIANO DI TECNOLOGIA [IT] ET AL) 17 September 2009 (2009-09-17) figure 4	10
Y	----- US 2011/021917 A1 (MORITA KIYOKAZU [JP]) 27 January 2011 (2011-01-27) paragraph [0206]; figure 1	6,7,9
Y	----- US 2010/109486 A1 (POLYAKOV ILYA [US] ET AL) 6 May 2010 (2010-05-06) figures 2A,2B	5,11,13
Y	----- DE 103 35 019 A1 (ROBERT BOSCH GMBH [DE]) 17 February 2005 (2005-02-17) figures 1,6 -----	14

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/068650

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-15

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-15

Method of fabricating a stacked electroactive transducer by using a cyclic process

2. claim: 16

Method of producing an actuator assembly of at least two stacked actuators with a conductively filled via pierced through each actuator

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2013/068650

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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